This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A method of analyzing ions to enhance the separation of groups of ions with different charge states, the method comprising:

(1) providing a stream of ions, wherein the stream of ions includes at least a first group of ions having a first charge state and a second group of ions having a second charge state and injecting at least a portion of the stream of ions into an ion processing section for an injection period;

(2) trapping at least some of the injected ions in the ion processing section in an axial direction of the ion processing section;

(3) thermalizing the trapped ions; and

(4) providing, in the ion processing section, an energy barrier having a barrier magnitude that is constant for at least a separation time period, wherein, during the separation time period:

(a) the energy barrier has a first effective barrier height with respect to ions in the first group, wherein the first effective barrier height is equal to the first charge state multiplied by the barrier magnitude, and wherein the first effective barrier height is less than the kinetic energy of the first group of ions; and

(b) the energy barrier has a second effective barrier height with respect to ions in the second group, wherein the second effective barrier height is equal to the second charge state multiplied by the barrier magnitude, and wherein the second effective barrier height is greater than the kinetic energy of the second group of ions,

thereby allowing ions in the first group to preferentially escape from the ion processing section.

2. (previously presented) A method as claimed in claim 1 which includes, in step (3), ensuring that the energy distribution amongst the ions is sufficiently low to provide adequate separation between the first and second groups of ions, allowing a substantial portion of the first group of ions to escape from the ion

processing section and trapping a substantial portion of the second group of ions in the ion processing section.

3. (previously presented) A method as claimed in claim 2, which includes, in step (3), thermalizing the ions by collision with a neutral gas.

4. (previously presented) A method as claimed in claim 2 or 3, which includes, after allowing ions in the first group to escape from the ion processing section, subjecting the second group of ions to mass analysis.

5. (cancelled)

6. (presently amended) A method as claimed in claim ~~5~~ 4 which includes providing a quadrupole rod set in the ion processing section and effecting said mass analysis within the quadrupole rod set.

7. (original) A method as claimed in claim 6, which includes effecting mass analysis in the processing section by scanning the second group of ions out of the quadrupole rod set by axial ejection.

8. (original) A method as claimed in claim 7, which includes, after scanning out the second group of ions from the quadrupole rod set to effect mass analysis, applying voltages to the ion trap, to empty the ion trap.

9. (previously presented) A method as claimed in claim 2 or 3, which includes effecting mass analysis on the first group of ions.

10. (original) A method as claimed in claim 9 which includes effecting said mass analysis using a multipole rod set.

11. (original) A method as claimed in claim 10, which includes effecting said mass analysis using a quadrupole rod set.

12. (original) A method as claimed in claim 9, which includes effecting said mass analysis in a time of flight mass spectrometer.

13. (original) A method as claimed in claim 9, which includes effecting said mass analysis using a Fourier transform mass spectrometer.

14. (original) A method as claimed in claim 9, which includes effecting said mass analysis using a 3-dimensional ion trap mass spectrometer.

15. (original) A method as claimed in claim 9, which includes, operating the ion processing section as an ion trap, the method comprising:

(i) In step (1), injecting a stream of ions into the processing section for an injection period; and

(ii) In step (2), terminating supply of ions to the processing section, and thermalizing ions in the ion processing section.

16. (previously presented) A method as claimed in claim 9, which includes:

(a) injecting a stream of ions into the processing section for an injection period, providing the energy barrier to permit the first group of ions to be substantially emptied from the processing section for mass analysis;

(b) resetting the energy barrier to a lower level to permit a subsequent group of ions having a higher charge to be substantially emptied from the processing section, for separate mass analysis; and

(c) repeating steps (a) and (b) to enable mass analysis of each of a plurality of groups of ions having different charges.

17. (original) A method as claimed in claim 16, which includes:

(a) providing for injection of the stream of ions, in step (1), into the processing section, and ensuring that the ions in the processing section have said sufficiently low energy distribution; and

(b) after all desired groups of ions have been emptied from the processing section for mass analysis, repeating the step of injecting ions into the processing section, to provide further ions for analysis.

18. (original) A method as claimed in claim 4, which includes, prior to supplying the stream of ions to the processing section, generating a stream of ions of an analyte, mass selecting a desired m/z of an analyte ion in a first mass analysis step, and injecting the desired ion into the processing section for analysis, wherein the mass analysis of the second group of ions comprises a second mass analysis step.

19. (original) A method as claimed in claim 18, which includes, in the first mass analysis step mass selecting a precursor ion as the desired ion, subjecting the precursor ion to a collisional process to generate fragment ions, and passing the fragment ions and any remaining precursor ions into the processing section.

20. (original) A method as claimed in claim 19, which includes effecting said second mass analysis step in the processing section, to mass analyze said second group of ions.

21. (original) A method as claimed in claim 19, which includes mass analyzing said at least to first group of ions having a first charge externally to the processing section.

22. (original) A method as claimed in claim 21, which includes effecting the second mass analysis step in one of a multipole mass spectrometer, a quadrupole mass spectrometer, a time of flight mass spectrometer, and a Fourier transform mass spectrometer.

23. (original) A method as claimed in claim 21, which includes:

(a) injecting a stream of ions into the processing section for an injection period, providing an energy barrier to permit a first group of ions having a first charge to be emptied from the processing section for mass analysis;
(b) resetting the energy barrier to a lower level to permit a subsequent group of ions having a higher charge to be emptied from the processing section for mass analysis; and

(c) repeating steps (a) and (b) to enable mass analysis of each of a plurality of groups of ions having different charges.

24 (previously presented). A method as claimed in claim 1 wherein the length of the separation time period is between 1 to 50 ms.